

DESCRIPTION OF THE SPIDER
***MASONCUS POGONOPHILUS* (ARANEAE, LINYPHIIDAE),**
A HARVESTER ANT MYRMECOPHILE

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ABSTRACT. One species of the genus *Masoncus* (Araneae, Linyphiidae) is described and illustrated. *Masoncus pogonophilus* new species has been collected exclusively inside the nests of the Florida harvester ant, *Pogonomyrmex badius* (Latreille) (Hymenoptera, Formicidae) and is, therefore, considered a myrmecophile, or obligate ant associate. Morphological characters separating this new species from two of the three described congeners (*M. arienus* and *M. conspectus*) are noted.

Three species are included in the genus *Masoncus* Chamberlin 1948: *M. arienus* Chamberlin 1948, *M. dux* Chamberlin 1948, and *M. conspectus* (Gertsch & Davis 1936) (synonymized with *M. nogales* Chamberlin 1948 by Ivie 1967). The female holotype of *M. dux* has been lost and I was unable to locate any specimens of this species. The female holotype, male allotype and paratypes of *M. nogales* designated by Chamberlin (1948) have also been lost. However, the holotype of *Tapinocyba conspecta* is housed at the American Museum of Natural History in New York City, New York (AMNH) as are other representatives of this species. The holotype and paratypes of *M. arienus* designated by Chamberlin (1948) are also at AMNH. One male representative of *M. arienus* is housed at the California Academy of Sciences in San Francisco, California (CAS).

No information was recorded either in the original species descriptions or on the collecting labels of the existing specimens regarding the natural history of the described species. *M. dux* was described from a single female collected in northern Manitoba, Canada. All specimens of *M. arienus* were collected in Arizona. *M. conspectus* was described from the male holotype and two male paratypes collected in Texas. Other records of this species include Arizona and Florida (the latter collected by the shores of Newnan's Lake in Alachua County).

Masoncus pogonophilus new species was originally collected by Sanford Porter from the nests of the Florida harvester ant, *Pogonomyrmex badius* (Latreille) (Hymenoptera, Formicidae) (Porter 1985). It is included in the genus *Masoncus* due to the presence of distinct cephalic

pits and a straight, distally bifid embolic division in the males (see genus description below).

In the species description that follows, I use primarily carapace, genitalic, chaetotaxic, numeric, and palpal characters deemed most useful by Millidge (1980) for erigonine spiders. These characters include: 1) the overall conformation of the male palpal organ, 2) the shape of the embolic division, 3) the external appearance of the epigynum, 4) the number of dorsal trichobothria present on the palpal tibia of both sexes, 5) the number of dorsal tibial spines present (expressed by the formula a:b:c:d), 6) the number of dorsal metatarsal trichobothria present (expressed by the formula I:II:III:IV), 7) the relative position of the dorsal metatarsal trichobothrium on leg I (expressed by the formula $TmI = \text{distance from tibia-metatarsus joint to trichobothrium} / \text{distance from tibia-metatarsus joint to metatarsus-tarsus joint}$), and 8) the relative stoutness of tibia I (expressed by the formula $TibI = \text{length of tibia} / \text{width of tibia viewed laterally}$). Overall body size, body color, and number of setae on the carapace are also given. Certain of these characters as well as others used in Chamberlin's (1948) descriptions or obvious on the existing specimens are of particular value in separating *M. arienus*, *M. conspectus*, and *M. pogonophilus* (Table 1). All measurements were taken directly from the specimens using an ocular micrometer in a dissecting microscope. Measurements were rounded to the nearest 0.1 mm.

Masoncus Chamberlin 1948

The type species of the genus is *M. arienus*. The genus *Masoncus* is characterized by both cephalic pits in the males and a straight, distally

Table 1.—Morphological characters most useful in separating three of four *Masoncus* species. (All specimens of *M. dux* are lost, and the species description is based solely on the female holotype.) pme = posterior median eyes.

Characters	<i>M. arienus</i>	<i>M. conspectus</i>	<i>M. pogonophilus</i>
Location of cephalic pits in males	Pit opens back of posterior eyes; not extending under pme	Pit opens and extends beneath pme	Pit opens and extends beneath pme
Cheliceral spurs towards distal end	Present on males and females	Present on males; reduced to very small black spurs on females	No cheliceral spurs on males or females
Setigerous nodule or spur anterior to fang groove	Nodule present on males and females	Spur on males; lacking on females	No setigerous nodule or spur on males or females
Endites with small spur on ectal side of tip	Present on males and females	Present on males and females although less distinct on latter	No spurs on endites of males or females
Shape of palpal tibia	Widely spaced black-tipped processes on distal edge flush w/ surface of tibia; long setal fringe on lateral edge	Closely spaced black-tipped processes on distal edge extending slightly away from surface of tibia; long setal fringe on lateral edge (fig. 97 in Chamberlin 1948)	Moderately spaced black-tipped processes on distal edge flush w/ surface of tibia; long setal fringe on lateral edge (see fig. 4)
Embolic division	Bifurcation begins close to tail-piece; each segment of bifurcation coiled (fig. 101 in Chamberlin 1948)	Distally bifid w/ proximal part of bifurcation bent forward and extending over most distal part which is, itself, squared off (fig. 98 in Chamberlin 1948 shows it pointed)	Distally bifid w/ proximal part of bifurcation bent forward and extending over most distal part which is, itself, bifurcated (see Fig. 3)

bifid embolic division (Chamberlin 1948) (diagram of linyphiid palpal structures in Millidge 1980).

Masoncus pogonophilus new species
(Figs. 1–5)

Type.—The male holotype was collected 23 cm below ground inside a nest chamber of the Florida harvester ant, *Pogonomyrmex badius* in Archer Sandhills, 1.4 km west of the Levy County line off of State Road 24. The female allotype was collected from the same *P. badius* nest. She was found in a nest chamber 46.5 cm below ground. Both were collected on 25 September 1994 and both will be deposited in the arachnological collection at CAS.

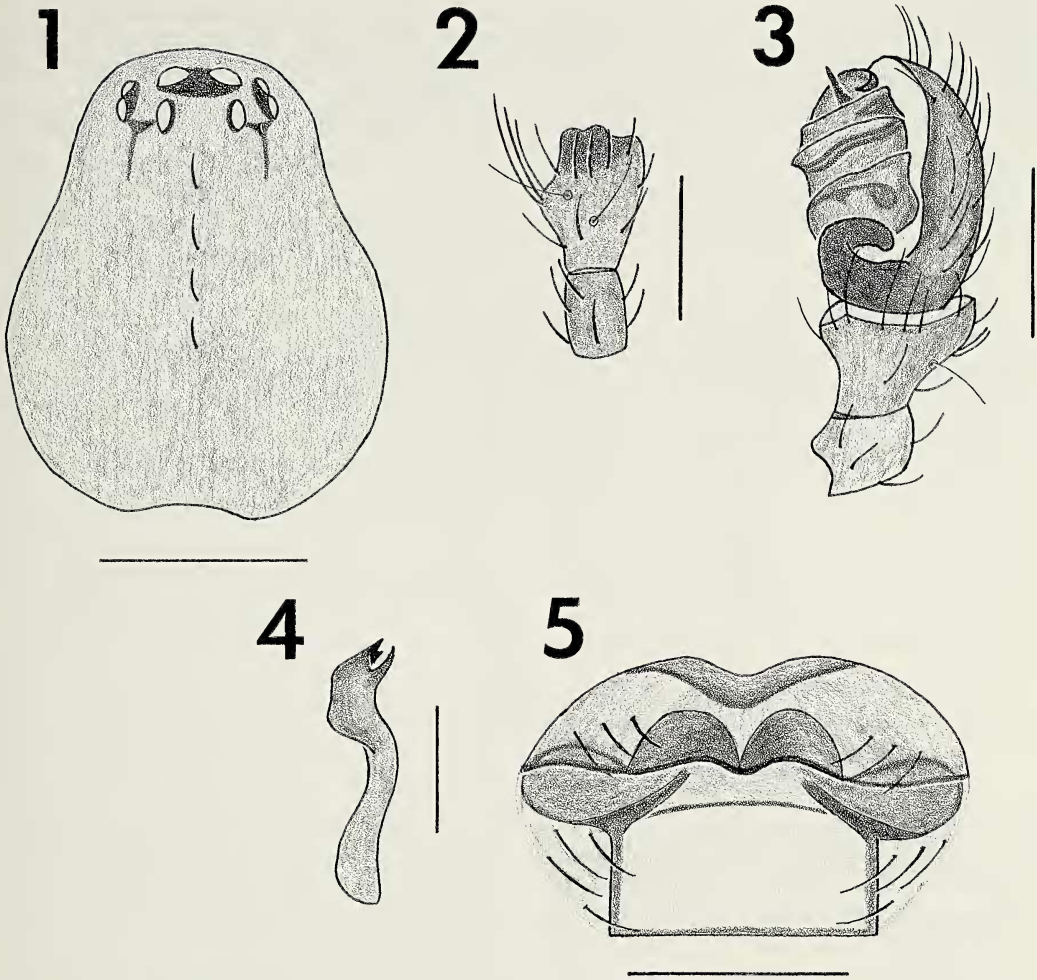
The holotype, 11 male paratypes, the allotype, and 12 female paratypes were used in this species

description. The collecting information as well as the future museum destination for these paratypes are presented in Table 2.

Etymology.—The specific epithet is derived from the generic name of the host ant with which the spider is found.

Holotype.—Total body length: 1.7 mm. Carapace length: 0.9 mm. Carapace width: 0.7 mm. Colors: carapace orange; abdomen grey; legs orange; sternum orange. Number of setae along midline of carapace: three. Palp as in Fig. 3. Embolic division as in Fig. 4. Number of trichobothria on palpal tibia: two (Fig. 2). Number of dorsal tibial spines: 1:1:1:1. Number of dorsal metatarsal trichobothria: 1:1:1:0. TmI: 0.82. TibI: 7.0.

Males (general).—($n = 12$). Total body length: 1.6–2.1 mm ($\bar{x} = 1.8 \pm 0.14$). Carapace length: 0.8–0.9 mm ($\bar{x} = 0.9 \pm 0.04$). Carapace width:



Figures 1-5.—*Masoncus pogonophilus* new species. 1, male carapace, dorsal view (scale = 0.4 mm); 2, tibia and patella of left male palp, dorsal view, trichobothria in circular pits (scale = 0.2 mm); 3, male palp, prolateral view (bifurcation of embolic division just visible distally) (scale = 0.2 mm); 4, embolic division of left male palp, mesoventral view (scale = 0.1 mm); 5, epigynum, ventral view (scale = 0.1 mm).

0.6–0.8 mm ($\bar{x} = 0.7 \pm 0.05$). Colors: carapace yellow-orange to orange; abdomen grey; legs yellow-orange to orange; sternum yellow-orange to orange. The color seems to fade severely when specimens are kept in isopropanol rather than ethanol. Number of setae along midline of carapace (Fig. 1): variable, 2–4 (setae easily broken in preservation). Palp as in Fig. 3. Embolic division as in Fig. 4. Number of trichobothria on palpal tibia: generally two (Fig. 2), however one male had two on the left palpal tibia and three on the right and another had three on the left and two on the right. Number of dorsal tibial spines: 1:1:1:1. Number of dorsal metatarsal tri-

chobothria: 1:1:1:0. TmI: 0.82–0.88 ($\bar{x} = 0.84 \pm 0.02$). TibI: 6.5–7.7 ($\bar{x} = 7.0 \pm 0.35$).

Females.—($n = 13$). Total body length: 1.5–1.9 mm ($\bar{x} = 1.8 \pm 0.13$). Carapace length: 0.8–1.2 mm ($\bar{x} = 0.9 \pm 0.11$). Carapace width: 0.6–0.9 mm ($\bar{x} = 0.7 \pm 0.09$). Colors: same as males. Number of setae along midline of carapace: variable, 2–5; females also had smaller setae scattered on either side of midline. Epigynum as in Fig. 5. Number of trichobothria on palpal tibia: generally three, however one female had two on both palps, three other females had three trichobothria on the left palpal tibia and two on the right. Number of dorsal metatarsal trichoboth-

Table 2.—Collection information and museum destination for the 23 paratypes. All were collected from the nests of the Florida harvester ant, *P. badius*. MCZ = Museum of Comparative Zoology, Cambridge, Massachusetts; DPI = Division of Plant Industry, Gainesville, Florida; AMNH = American Museum of Natural History, New York, New York; CAS = California Academy of Sciences, San Francisco, California.

Collection date	Florida county	Collector	Number of specimens	Museum
Males				
10- XI-1982	Leon	S. D. Porter	1	MCZ
9- XI-1984	Leon	S. D. Porter	1	MCZ
13- I-1990	Walton	Skelley, Turnbow & Thomas	2	DPI
14- I-1990	Okaloosa	Skelley, Turnbow & Thomas	1	DPI
9- V-1992	Leon	P. E. Cushing	1	DPI
26- V-1992	Levy	P. E. Cushing	2	AMNH
8- X-1992	Levy	P. E. Cushing	1	AMNH
20- II-1993	Levy	P. E. Cushing	1	CAS
25- IX-1994	Levy	P. E. Cushing	1	CAS
Females				
3- I-1990	Okaloosa	P. Skelley	1	DPI
13- I-1990	Walton	Skelley, Turnbow & Thomas	1	DPI
9- V-1992	Leon	P. E. Cushing	1	DPI
28- II-1993	Putnam	P. E. Cushing	4	AMNH
25- VII-1993	Putnam	P. E. Cushing	1	MCZ
25- IX-1994	Levy	P. E. Cushing	4	CAS

ria: 1:1:1:0. TmI: 0.58–0.87 ($\bar{x} = 0.81 \pm 0.09$). TibI: 6.5–7.9 ($\bar{x} = 7.1 \pm 0.38$).

Diagnosis.—The carapace of male *M. pogonophilus* most resembles that of *M. conspectus* (fig. 93 in Chamberlin 1948 and Fig. 1). In both species, the cephalic pits extend beneath the posterior median eyes (pme) whereas in *M. arienus* the cephalic pits open behind the pme. The embolic division of male *M. pogonophilus* new species most resembles *M. conspectus* (fig. 98 in Chamberlin 1948 and Fig. 4) in that both are

distally bifid with the proximal part of the bifurcation bent forward and extending over the most distal part of the bifurcation. However, in *M. pogonophilus* the most distal part of the bifurcation is, itself, bifurcated, whereas in *M. conspectus* it is flattened (although fig. 98 in Chamberlin 1948 shows it to be pointed). In *M. arienus* the embolic division is also bifid, but the bifurcation begins very close to the tailpiece and each segment of the bifurcation is coiled (see fig. 101 in Chamberlin 1948). The male palpal tibia of the new species, as with *M. conspectus* and *M. arienus*, is fringed laterally with long setae (Fig. 2). Chamberlin 1948 (fig. 102) does not show this fringe of setae on his drawing of *M. arienus* but it is evident on the preserved specimens. All three species have two black-tipped processes on the distal edge of the palpal tibia (Fig. 2). These processes are more widely spaced in *M. arienus* than in either *M. conspectus* or in *M. pogonophilus*. The black-tipped process in *M. conspectus* is found on a slight ridge that extends away from the surface of the tibia (fig. 97 in Chamberlin 1948). Interestingly, *M. conspectus* is the only one of the three previously described congeners whose known distribution extends into northern Florida. The new species can be sepa-

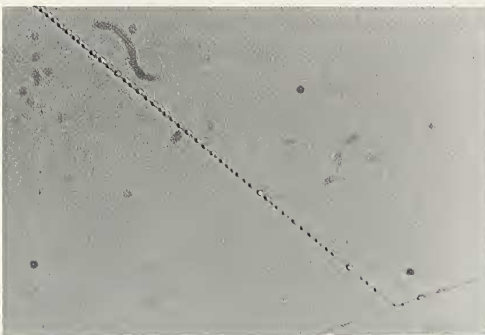


Figure 6.—Sticky silk from adult male *Masoncus pogonophilus* new species web. Magnification 400 \times .

rated from the congeners based primarily upon characters described in Table 1 as well as upon overall size; the new species being somewhat smaller than *M. dux*, *M. arienus* and *M. conspectus*, which are all between 2.10–2.65 mm in length according to Chamberlin (1948) and Gertsch & Davis (1936).

Natural History.—*Masoncus pogonophilus* new species lives within the nest chambers of the Florida harvester ant, *P. badius*. It is about ¼ the size of its 7–9 mm long host and feeds on collembolans found throughout the 1–3 m deep subterranean nests (Porter 1985). The ant nest provides a stable microclimate as well as an abundant food source for the spider. The spiders have never been collected outside the ant nests and are extremely susceptible to desiccation when removed from the nests. They appear, therefore, to be obligate ant symbionts, or myrmecophiles.

Immigration to new nest sites is common in *P. badius* (Gentry & Stiritz 1972; Golley & Gentry 1964; Gordon 1992). While observing three such colony migrations, each occurring either just after a summer shower or in the early morning when the surface temperature was cool and the humidity high, I saw spiders and collembolans moving from the old colony site to the new amidst their host ants within the emigration trails. Using a PCR (polymerase chain reaction)-based molecular technique, I have also found evidence that spiders disperse between neighboring ant nests (pers. obs.).

Both sexes of *M. pogonophilus* build prey capture webs in the lab, and I have seen webs inside the ant nest chambers. Both males and females produce sticky silk (Fig. 6). Therefore, males presumably retain the aggregate and flagelliform glands into adulthood; most adult male spiders lose these glands during the terminal molt and cannot subsequently produce sticky silk (Kovoor 1987). Maintaining the ability to produce sticky silk as adults may be common among male erigonine Linyphiids as I have observed such behaviors among other (unidentified) male erigonines.

Female *M. pogonophilus* lay 1–6 eggs in a disk-shaped eggsac deposited in a depression in the wall of a nest chamber ($n = 9$ eggsacs, $\bar{x} = 2.9 \pm 1.5$ eggs/eggsac). The eggsac is flush against the surface of the chamber walls. Juvenile spiders molt once inside the eggsac and pass through three additional molts before reaching maturity.

Juveniles are present inside the ant nests during all months of the year (Porter 1985; pers. obs.). Porter reported a 4:1 female-biased sex ratio among the spiders, while I have found an even more extreme 7.5:1 female-biased ratio. Due to the scarcity of eggsacs and the small number of eggs per eggsac, it has not been possible to determine whether this is a primary sex ratio bias.

ACKNOWLEDGMENTS

I am grateful to Mark Stowe, Susan Moegenburg, John Arnett, Joyce Thomas, Barbara C. Dixon, Michael E. Morgan, and Rebecca Forsyth for their help in collecting specimens. Thanks also to Drs. Jonathan Reiskind, Sanford Porter, Charles Dondale, and Charles Griswold for their helpful comments on drafts of this manuscript. Thanks also to CAS, AMNH, DPI and MCZ for loaning specimens. This work was supported by a Grinter Fellowship from the University of Florida and a Theodore Roosevelt Grant from the American Museum of Natural History.

LITERATURE CITED

- Chamberlin, R. V. 1948. On some American spiders of the family Erigonidae. *Ann. Entomol. Soc. America*, 41:483–562.
- Gentry, J. B. & K. L. Stiritz. 1972. The role of the Florida harvester ant, *Pogonomyrmex badius* in old field mineral nutrient relationships. *Environ. Entomol.*, 1:39–41.
- Gertsch, W. J. & L. I. Davis. 1936. New spiders from Texas. *American Mus. Novit.*, 881:1–21.
- Golley, F. B. & J. B. Gentry. 1964. Bioenergetics of the southern harvester ant, *Pogonomyrmex badius*. *Ecology*, 45:217–225.
- Gordon, D. M. 1992. Nest relocation in harvester ants. *Ann. Entomol. Soc. America*, 85:44–47.
- Ivie, W. 1967. Some synonyms in American spiders. *J. New York Entomol. Soc.*, 75:126–131.
- Kovoor, J. 1987. Comparative structure and histochemistry of silk-producing organs in arachnids. Pp. 160–186, *In* *Ecophysiology of Spiders*. (W. Nentwig, ed.) Springer-Verlag, Berlin.
- Millidge, A. F. 1980. The erigonine spiders of North America. Part 1. Introduction and taxonomic background (Araneae: Linyphiidae). *J. Arachnol.*, 8:97–107.
- Porter, S. D. 1985. *Masoncus* spider: a miniature predator of Collembola in harvester-ant colonies. *Psyche*, 92:145–150.

Manuscript received 4 December 1994, revised 6 March 1995.